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3/32, 3/34, G02F 1/16702143 (US). **ARANGO, Alexi, C.**; 116 College Avenue, Somerville, MA 02144-1918 (US). **AMUNDSON, Karl, R.**; Apt. No. 1, 56 Kirkland Street, Cambridge, MA 02138 (US). **AU, Joanna, F.**; Apt. No. 14, 311 Beacon Street, Boston, MA 02116 (US). **KNAIAN, Ara, N.**; 85 Pearl Street, Cambridge, MA 02138 (US). **ZALESKY, Jonathan, L.**; Apt. No. 1, 79 Fifth Street, Cambridge, MA 02141 (US).

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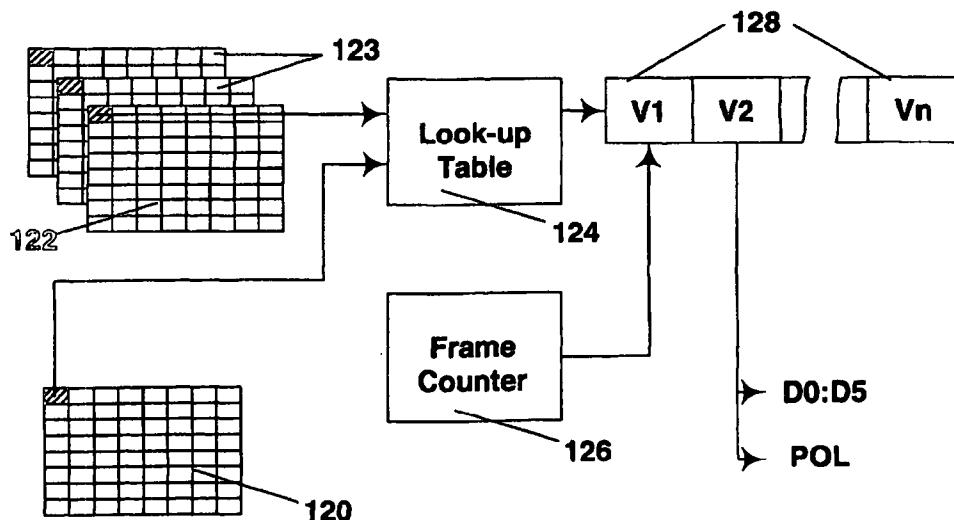
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60/319,040 21 December 2001 (21.12.2001) US(71) Applicant: **E INK CORPORATION** [US/US]; 733 Concord Avenue, Cambridge, MA 02138-1002 (US).(72) Inventors: **ZEHNER, Robert, W.**; Apt. No. 3, 16 Waterhouse Street, Somerville, MA 02144 (US). **GATES, Holly, G.**; Apt. No. 2, 189 Summer Street, Somerville, MA

(54) Title: METHODS FOR DRIVING BISTABLE ELECTRO-OPTIC DISPLAYS



(57) **Abstract:** A bistable electro-optic display has a plurality of pixels, each of which is capable of displaying at least three gray levels. The display is driven by a method comprising: storing a look-up table containing data representing the impulses necessary to convert an initial gray level to a final gray level; storing data representing at least an initial state of each pixel of the display; receiving an input signal representing a desired final state of at least one pixel of the display; and generating an output signal representing the impulse necessary to convert the initial state of the one pixel to the desired final state thereof, as determined from the look-up table. The invention also provides a method for reducing the remnant voltage of an electro-optic display.

WO 03/044765 A3



ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

A. CLASSIFICATION OF SUBJECT MATTER		G09G3/34	G02F1/167
IPC 7	G09G3/36	G09G3/32	

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7	G09G	G02F	G09F
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 236 385 B1 (INOUE AKIRA ET AL) 22 May 2001 (2001-05-22)	1,4, 10-14, 17,23-26
Y	abstract column 1, line 12 - line 20 column 22, line 1 - line 40 column 23, line 50 -column 27, line 50 column 30, line 64 -column 31, line 35 --- PATENT ABSTRACTS OF JAPAN vol. 018, no. 608 (E-1633), 18 November 1994 (1994-11-18) & JP 06 233131 A (FUJI FILM MICRO DEVICE KK; OTHERS: 01), 19 August 1994 (1994-08-19) abstract --- -/-	5-7, 18-20
Y		1,4-7, 13,14, 18-20, 25,26

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the International filing date
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Date of the actual completion of the International search	Date of mailing of the International search report
2 June 2003	12.09.03
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Wolff, L

C(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 09, 30 July 1999 (1999-07-30) & JP 11 113019 A (SONY CORP), 23 April 1999 (1999-04-23) abstract	1,4-7, 13,14, 18-20, 25,26
Y	US 5 654 732 A (KATAKURA KAZUNORI) 5 August 1997 (1997-08-05) abstract; figure 1B column 5, line 14 -column 7, line 19 column 9, line 1 - line 40 claims 1-3	1,4,13, 14,25,26
Y	WO 99 10870 A (BOCK HARALD REINHART ;SHARP KK (JP)) 4 March 1999 (1999-03-04) abstract; figure 6 page 7, line 6 -page 9, line 11 page 16, line 5 - line 13	1,13,14, 25,26

INTERNATIONAL SEARCH REPORT

tional application No.
PCT/US 02/37241

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-26

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-26

First invention:

It is a matter of a temperature compensation system (device and method) applicable to a bistable electro optique display able to image at least 3 gray levels, by using LUT in order to generate the adequate pulses wrt to the input signal representing the temperature value.

2. Claim : 27

Second invention:

It is a matter of a display controller able to compensate a signal to be displayed by using a LUT in order to generate AM and PWM pulses to drive the display device.

3. Claims: 28-30

Third invention:

It is a matter of a circuit driver able to receive voltage and polarity signals associated with a clock in order to drive an electro optique display in order to compensate the remanant voltage at pixel level

Patent document cited in search report	Publication date		Patent family member(s)	Publication date
US 6236385	B1	22-05-2001	JP 7175041 A US 5835075 A DE 69424330 D1 DE 69424330 T2 DE 69428465 D1 DE 69428465 T2 EP 0613116 A2 EP 0866441 A1 HK 1014288 A1 JP 2001228461 A JP 2001228462 A JP 2001235726 A KR 238903 B1 SG 72608 A1 US 5684503 A	14-07-1995 10-11-1998 15-06-2000 09-11-2000 31-10-2001 25-04-2002 31-08-1994 23-09-1998 29-12-2000 24-08-2001 24-08-2001 31-08-2001 15-01-2000 23-05-2000 04-11-1997
JP 06233131	A	19-08-1994	NONE	
JP 11113019	A	23-04-1999	NONE	
US 5654732	A	05-08-1997	JP 2766947 B2 JP 5027719 A JP 3082149 B2 JP 5027720 A AT 153469 T DE 69219828 D1 DE 69219828 T2 EP 0526095 A2 ES 2101036 T3	18-06-1998 05-02-1993 28-08-2000 05-02-1993 15-06-1997 26-06-1997 16-10-1997 03-02-1993 01-07-1997
WO 9910870	A	04-03-1999	WO 9910870 A1 JP 2001514399 T KR 2000057644 A	04-03-1999 11-09-2001 25-09-2000

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